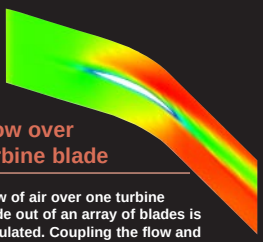
Computational Physics Support Group

The main function of the Computational Physics Support Group is to develop modeling methods, generate computational tools, and perform analyses for multiphysics numerical simulations. The group supports internal LLNL programs and projects directly funded by DOE and other organizations.

Flow instability

Numerical simulation of instability growth at the interface between two fluids provides information about the nature and extent of intermixing.

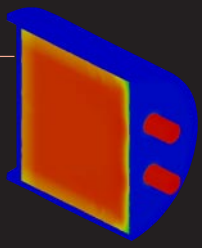


Flow over turbine blade

Flow of air over one turbine blade out of an array of blades is simulated. Coupling the flow and structural response allows investigation of the blade dynamics and failure mechanisms.

Extrusion

This simulation of metal extrusion focuses on understanding the flow pattern set up in the metal ingot. Heat transfer is included to provide the correct spatial and temporal distribution of temperature.

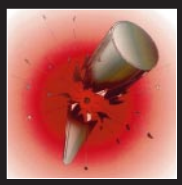


Incompressible external flow

Large-eddy simulation captures the 3D vortex shedding behind a slant-back body. Pressure iso-surfaces outline the structure of the flow in the wake.

We are applying this research to the investigation of truck aerodynamics for the Department of Energy.

Missile defense applications



Our unique knowledge of nuclear weapons enables us to evaluate damage and its effect on nuclear warheads. Activities include defining and evaluating threats and supporting test programs with design and numerical analysis efforts.

Structural Mechanics

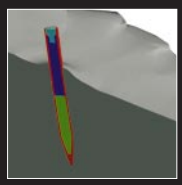
Fluid Dynamics

Heat Transfer

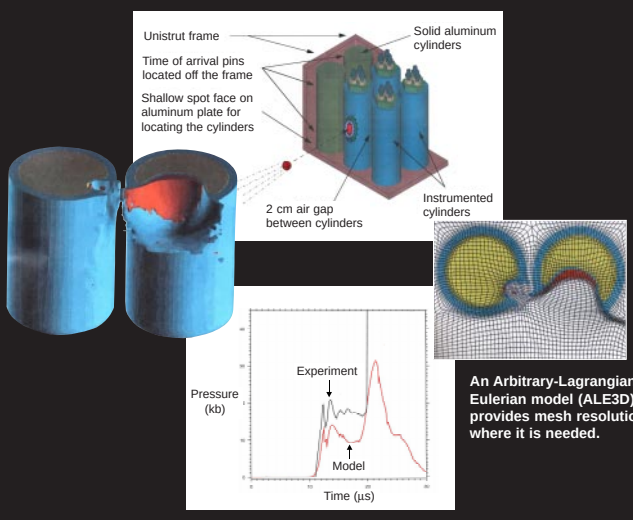
Chemistry

Penetration mechanics

The design of hard target penetrators requires an understanding of loading on key components. The deceleration history depends strongly on the treatment of the interface between target and projectile and on the material properties of the target. Relevant materials are often different types of concrete or geological in origin.



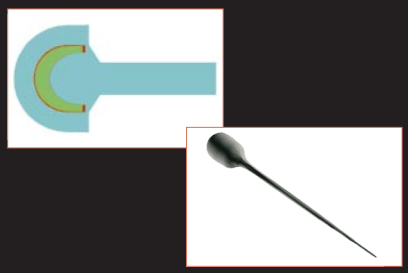
Hypervelocity impact



An Arbitrary-Lagrangian-Eulerian model (ALE3D) provides mesh resolution where it is needed.

Shaped-charge design

Shaped-charge formation can depend critically on 3D features such as manufacturing tolerances that perturb the design. It is important to be able to assess such effects numerically.



Engineering
Lawrence Livermore National Laboratory
September 1998